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(54) **DOCKING DEVICE FOR PORTABLE
COMPUTER AND DOCKING STRUCTURE**

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H05K 7/00 (2006.01)

(52) **U.S. Cl.** **361/683**; 361/680; 361/686;
312/223.3; 439/341

(58) **Field of Classification Search** 361/680,
361/683-686; 439/341; 312/223.3
See application file for complete search history.

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(57) **ABSTRACT**

A docking device for a portable computer to be mechanically and electrically connected to the portable computer to expand the function of the portable computer includes a tray for placing the rear end of the portable computer thereon and a locking unit for locking the portable computer on the tray by manual operation, in which the tray includes a claw member to be mated with an incised portion formed on the back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably by a predetermined angle, and the movable tray has two recesses equivalent in shape to legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking.

7 Claims, 10 Drawing Sheets

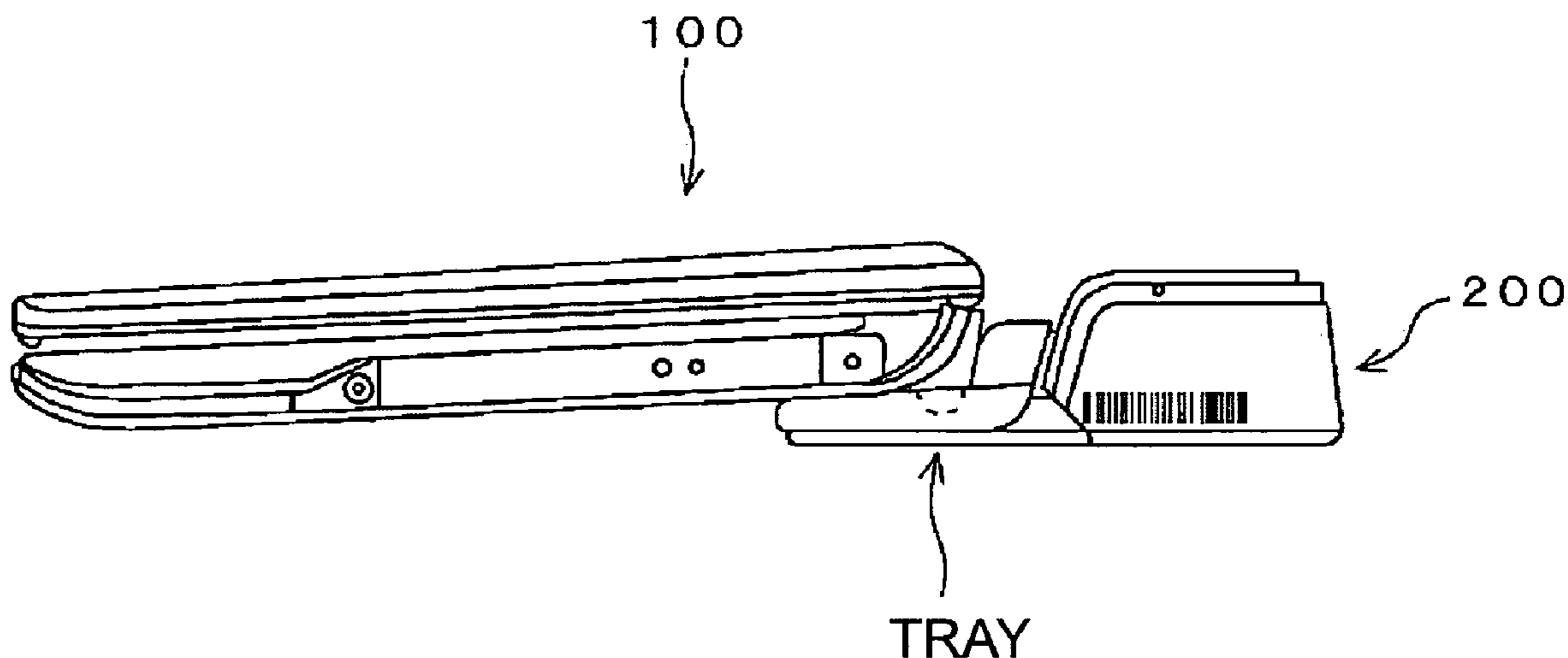


FIG. 1

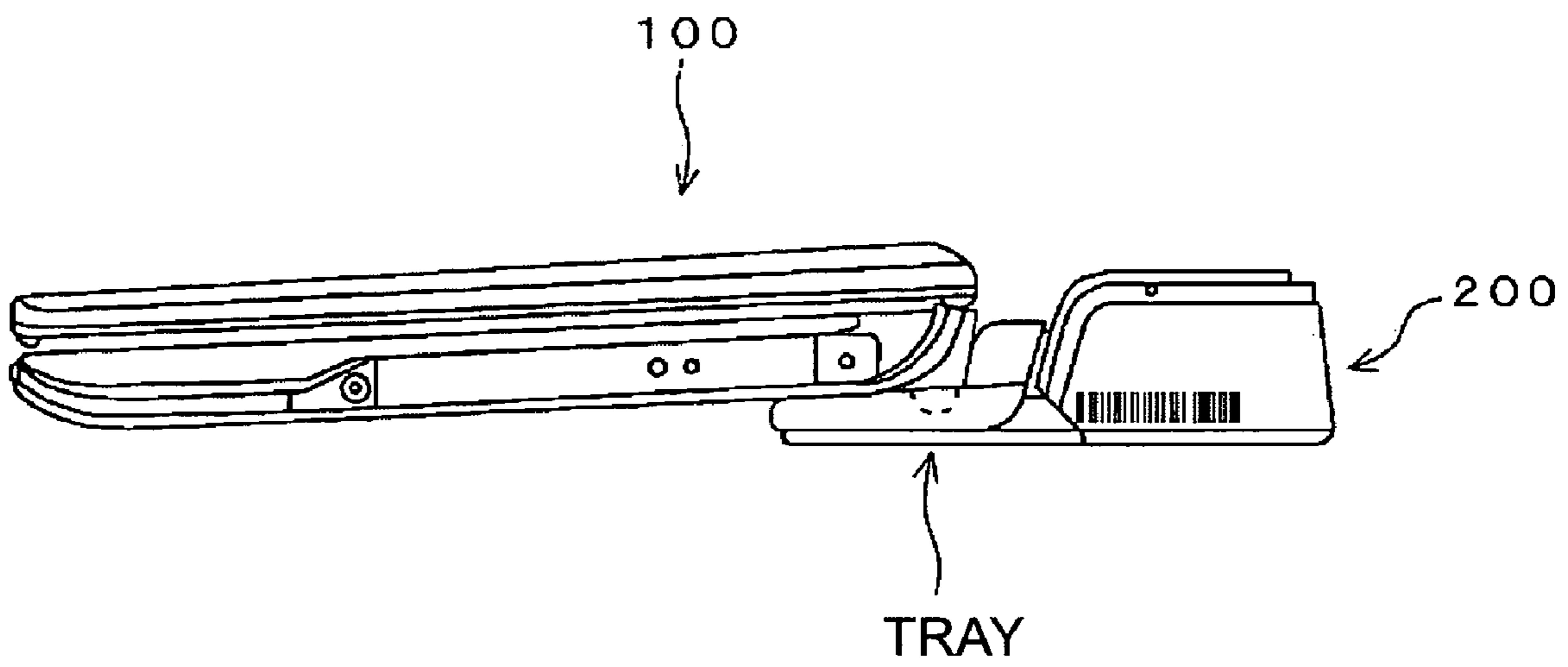


FIG. 2A

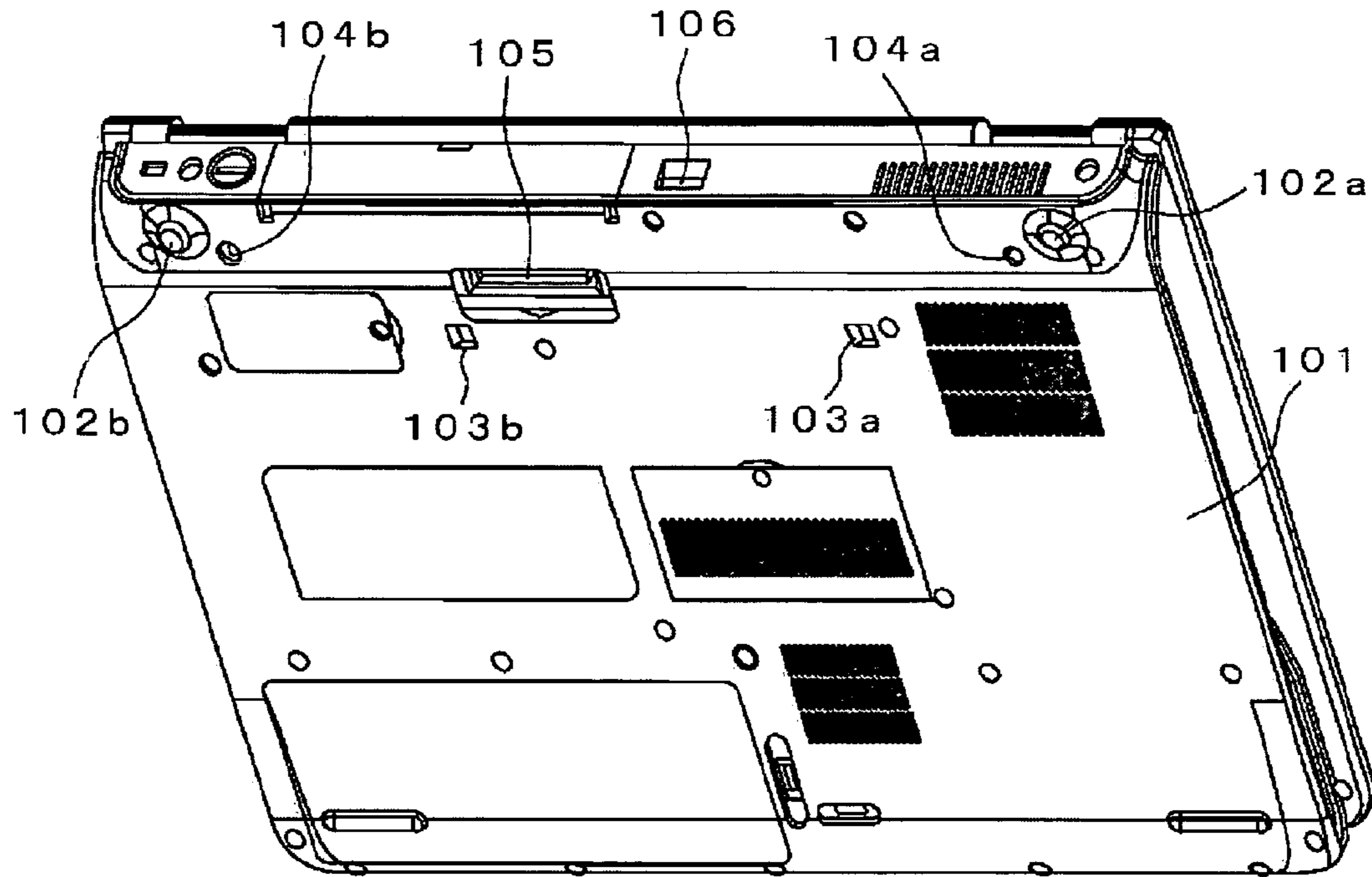


FIG. 2B

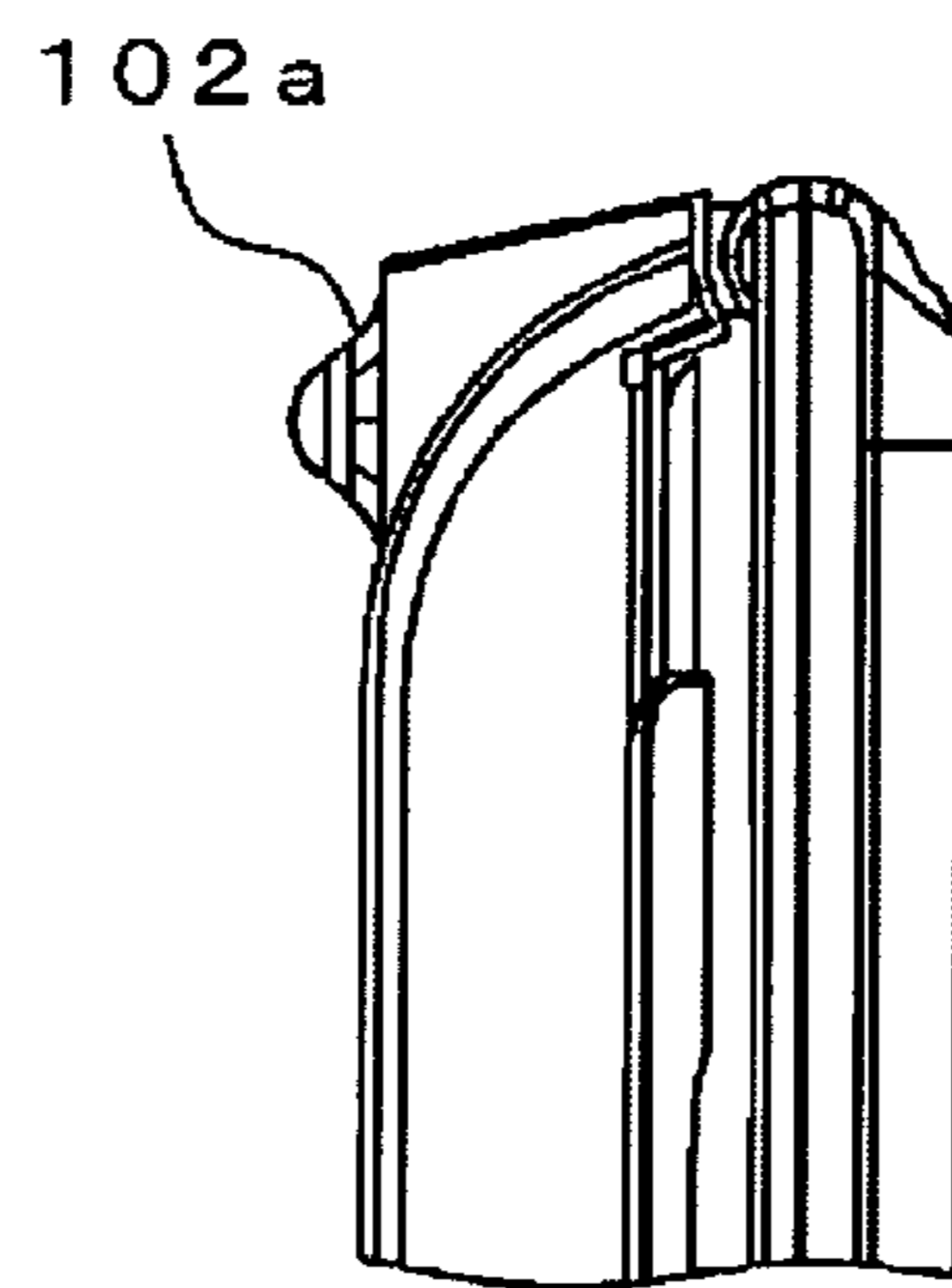


FIG. 3

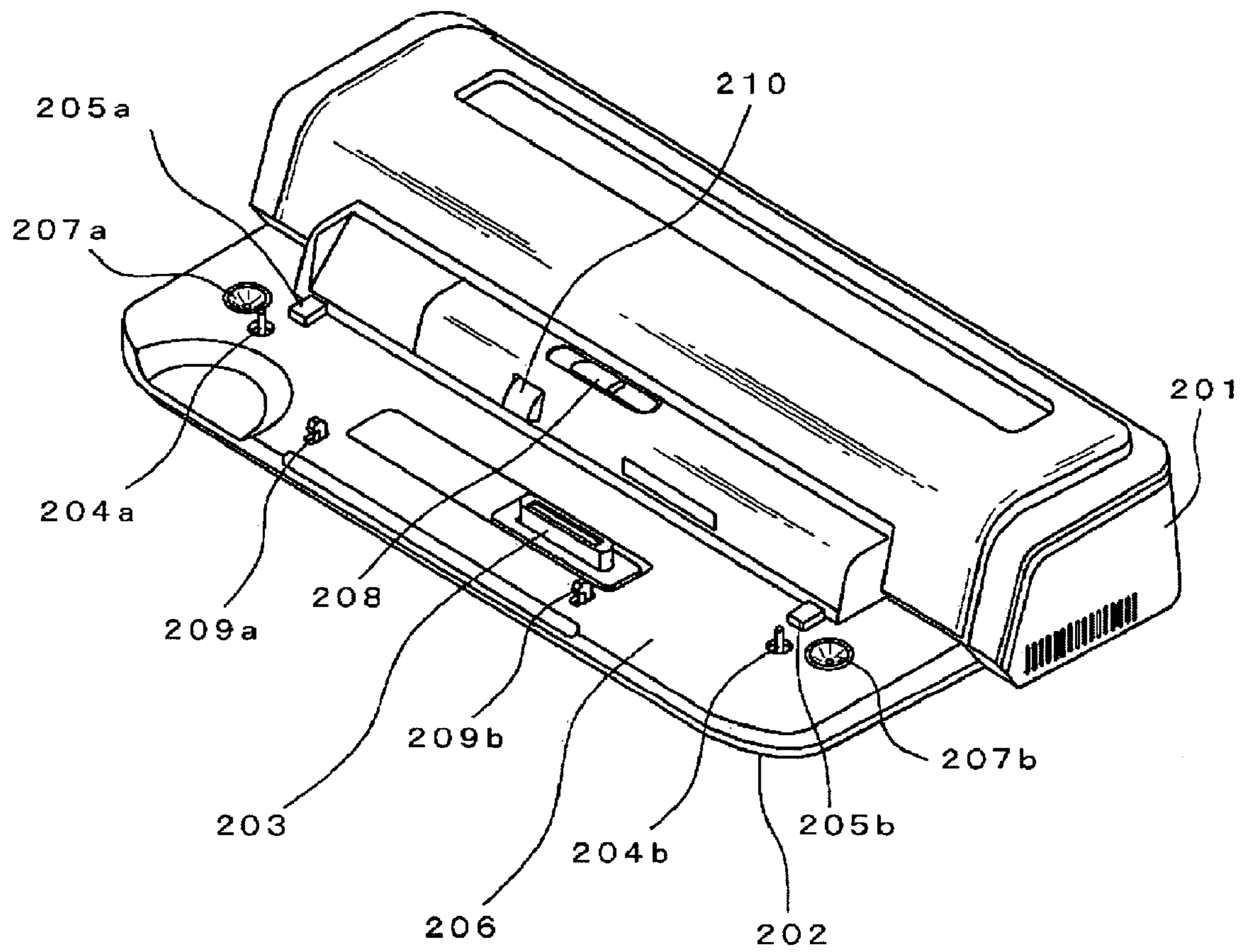


FIG. 4

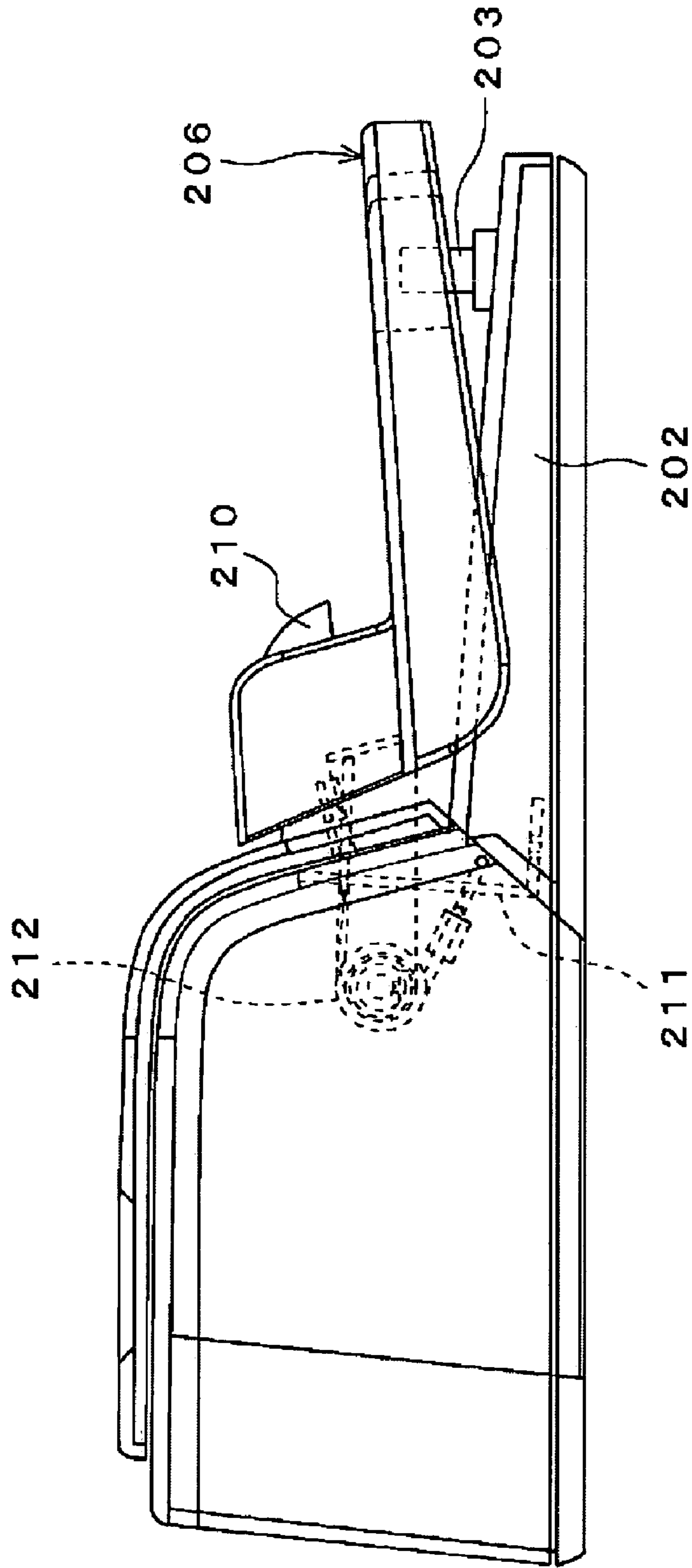


FIG. 5A

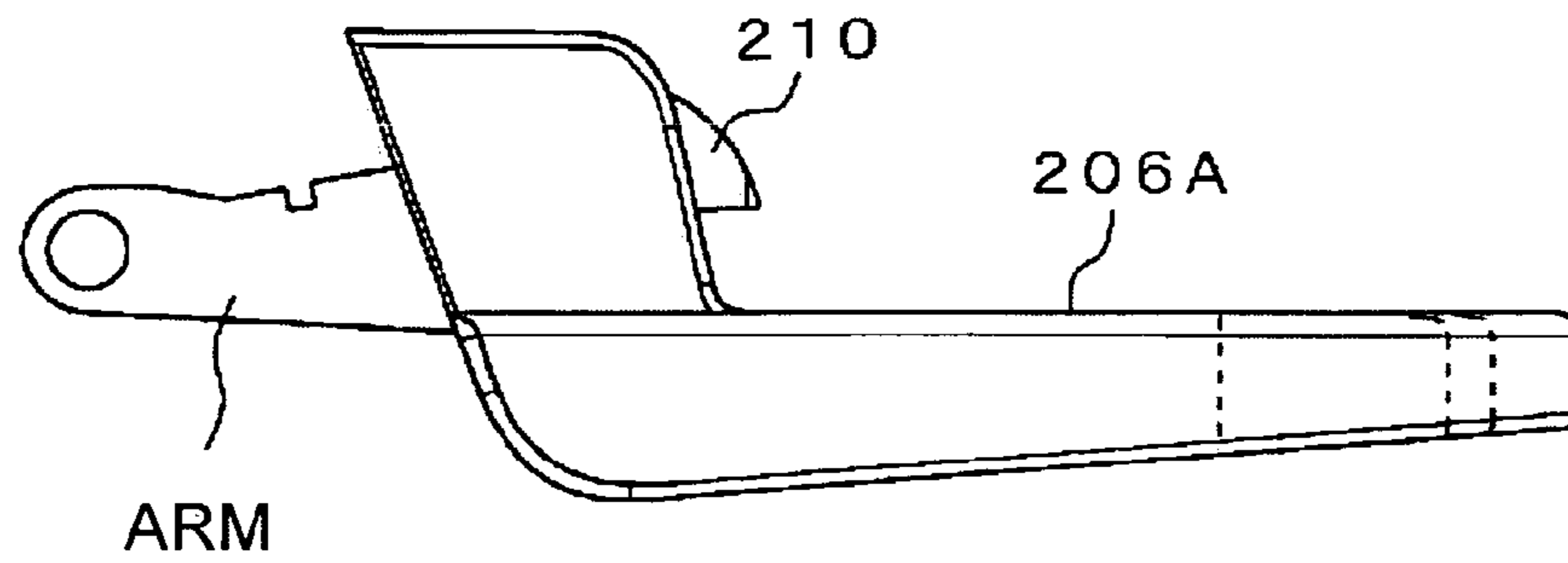


FIG. 5B

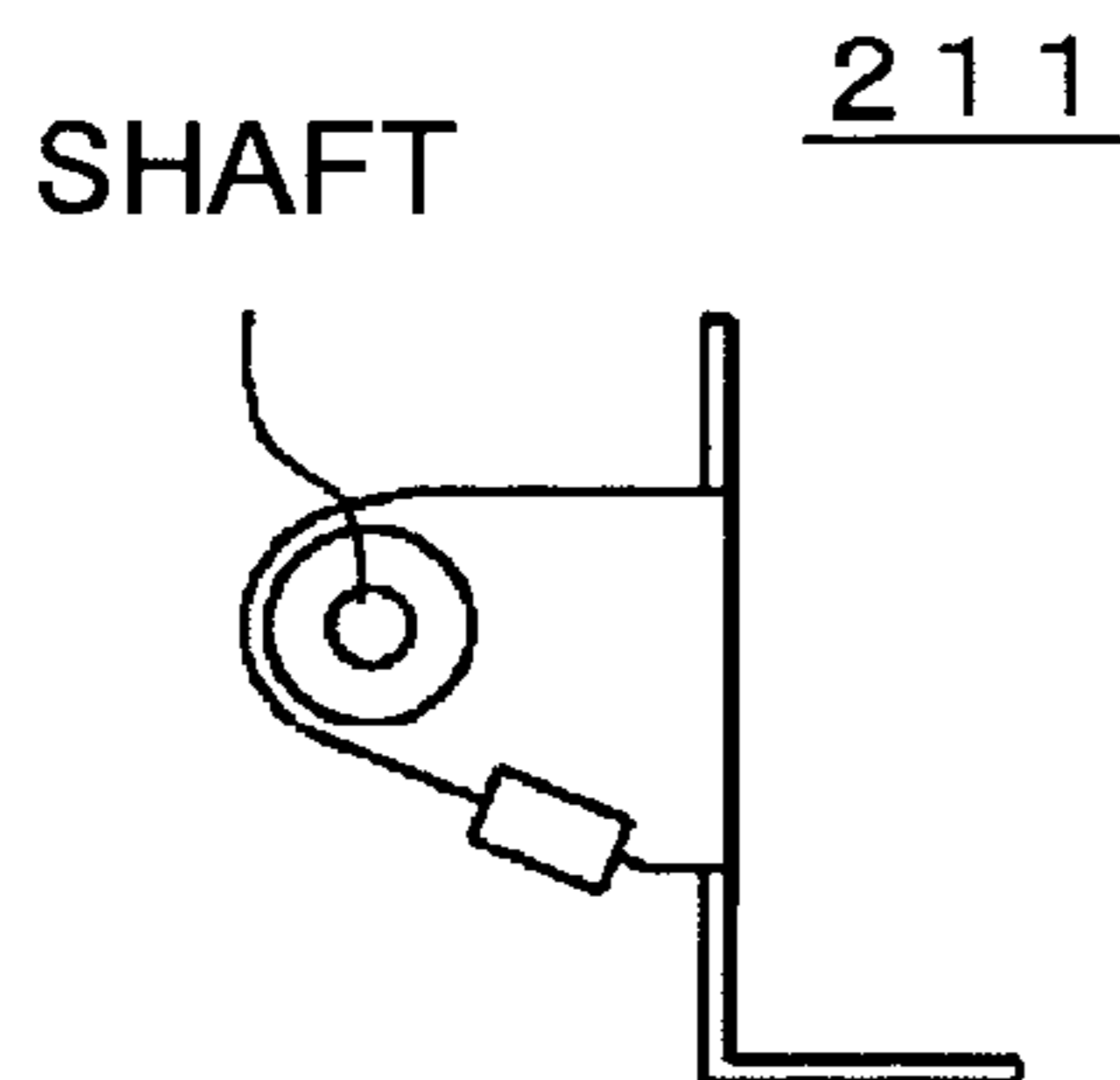


FIG. 5C

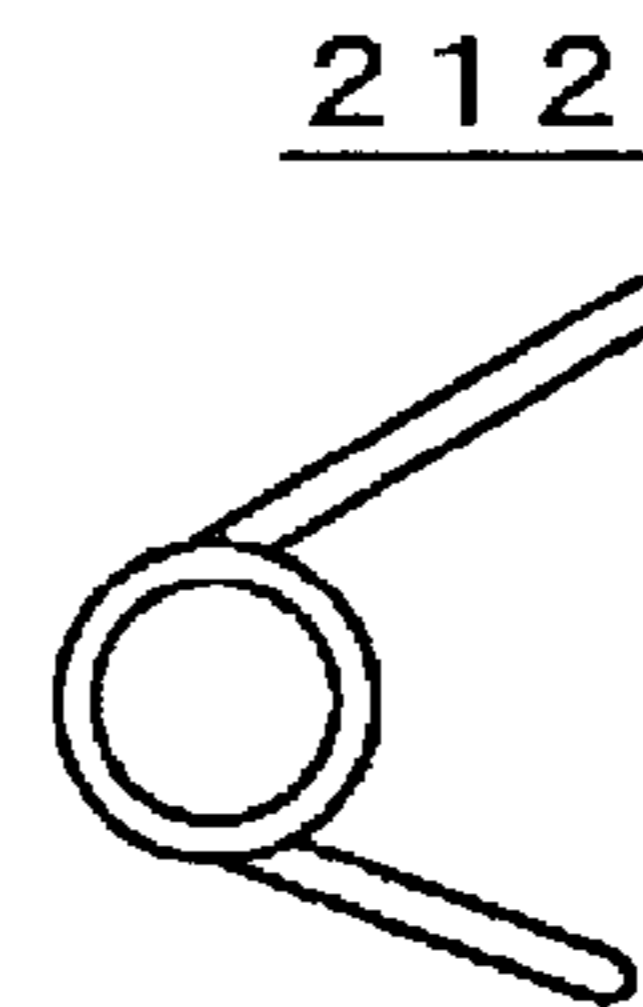


FIG. 6

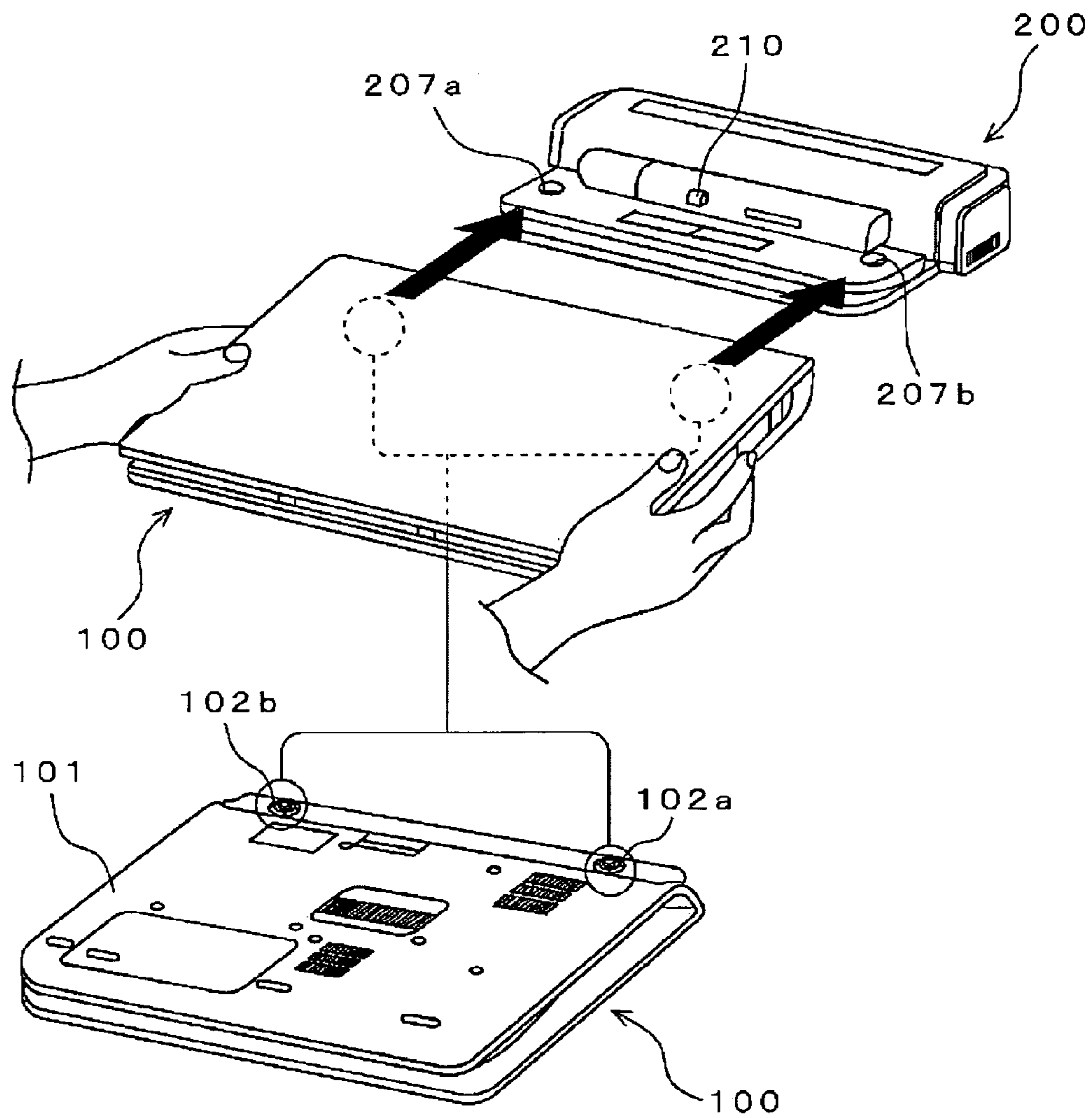


FIG. 7

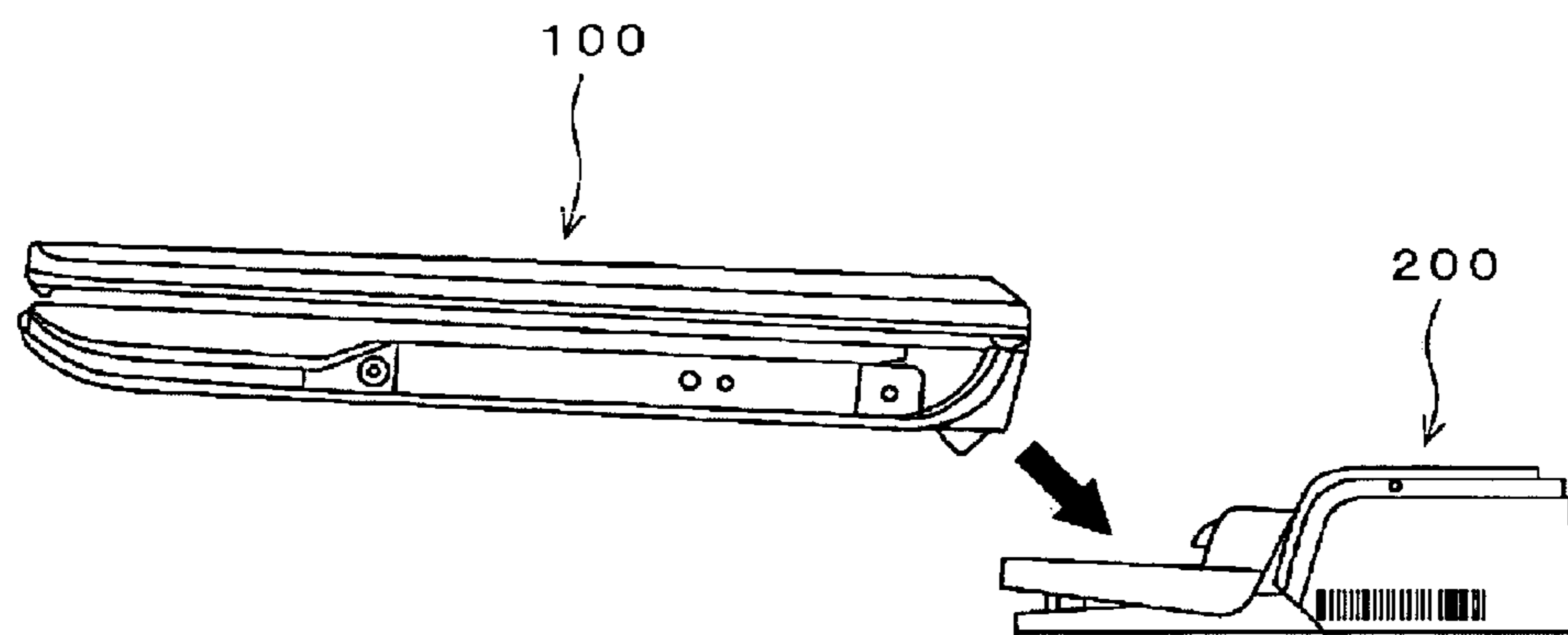
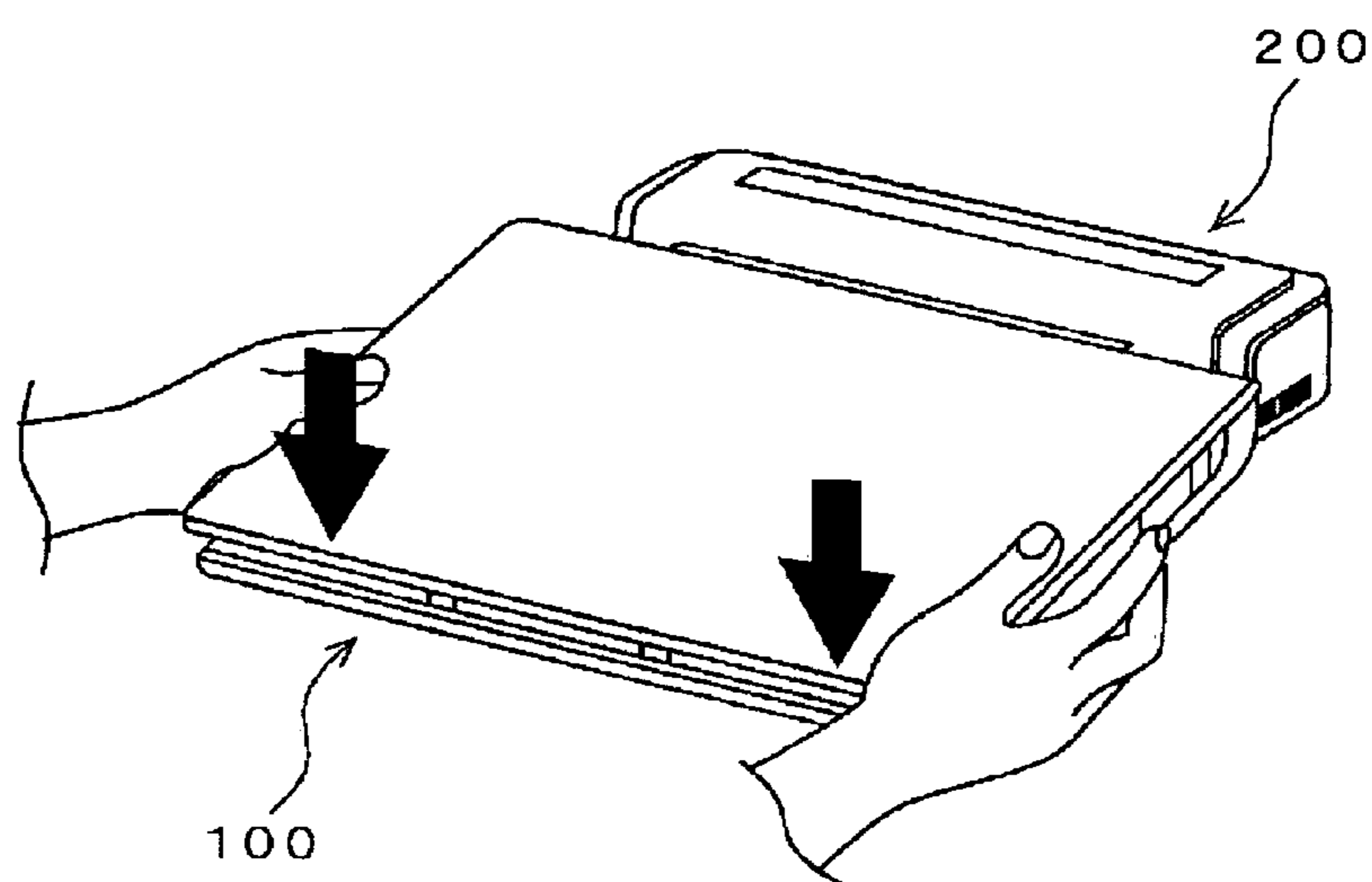


FIG. 8



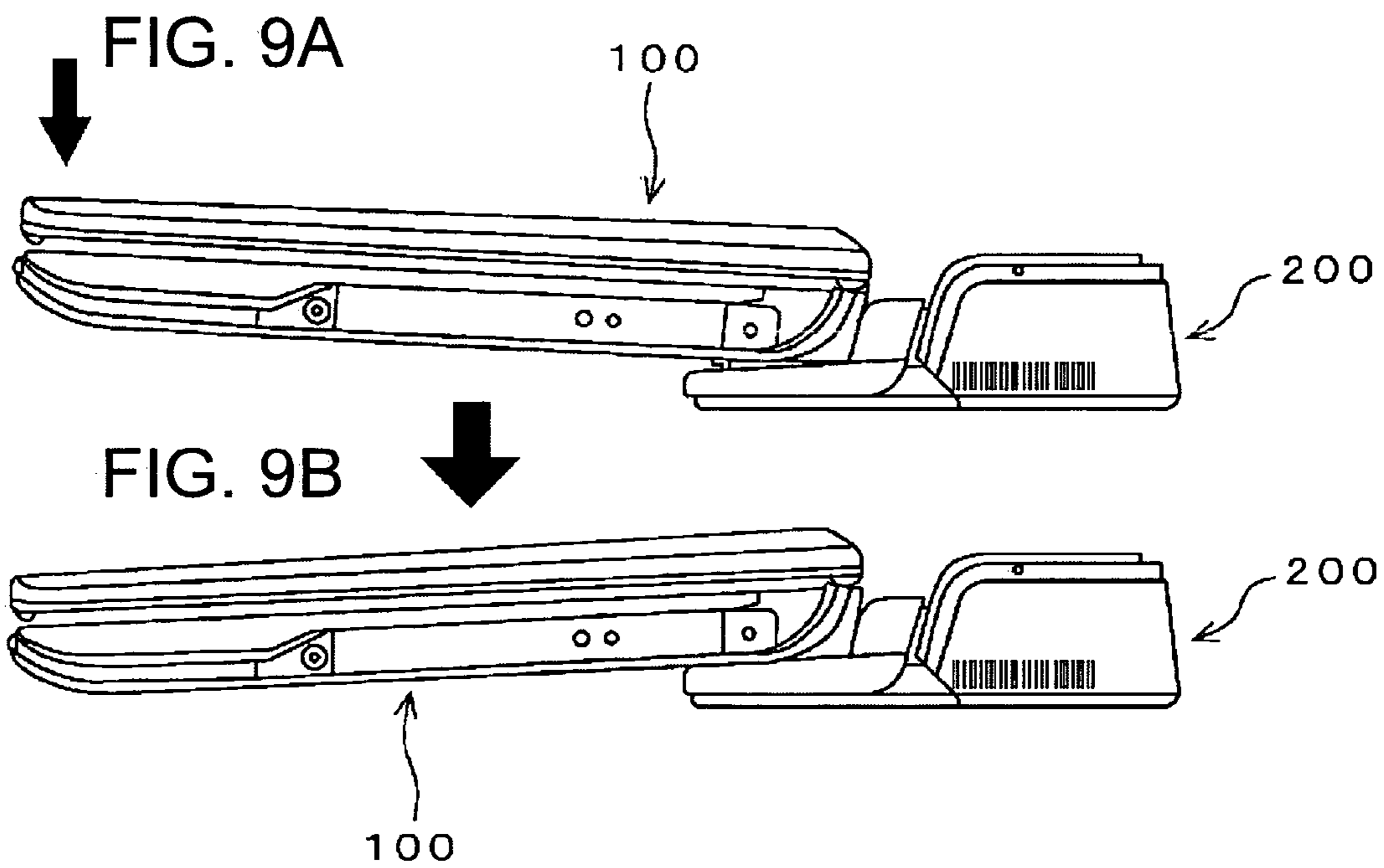


FIG. 10

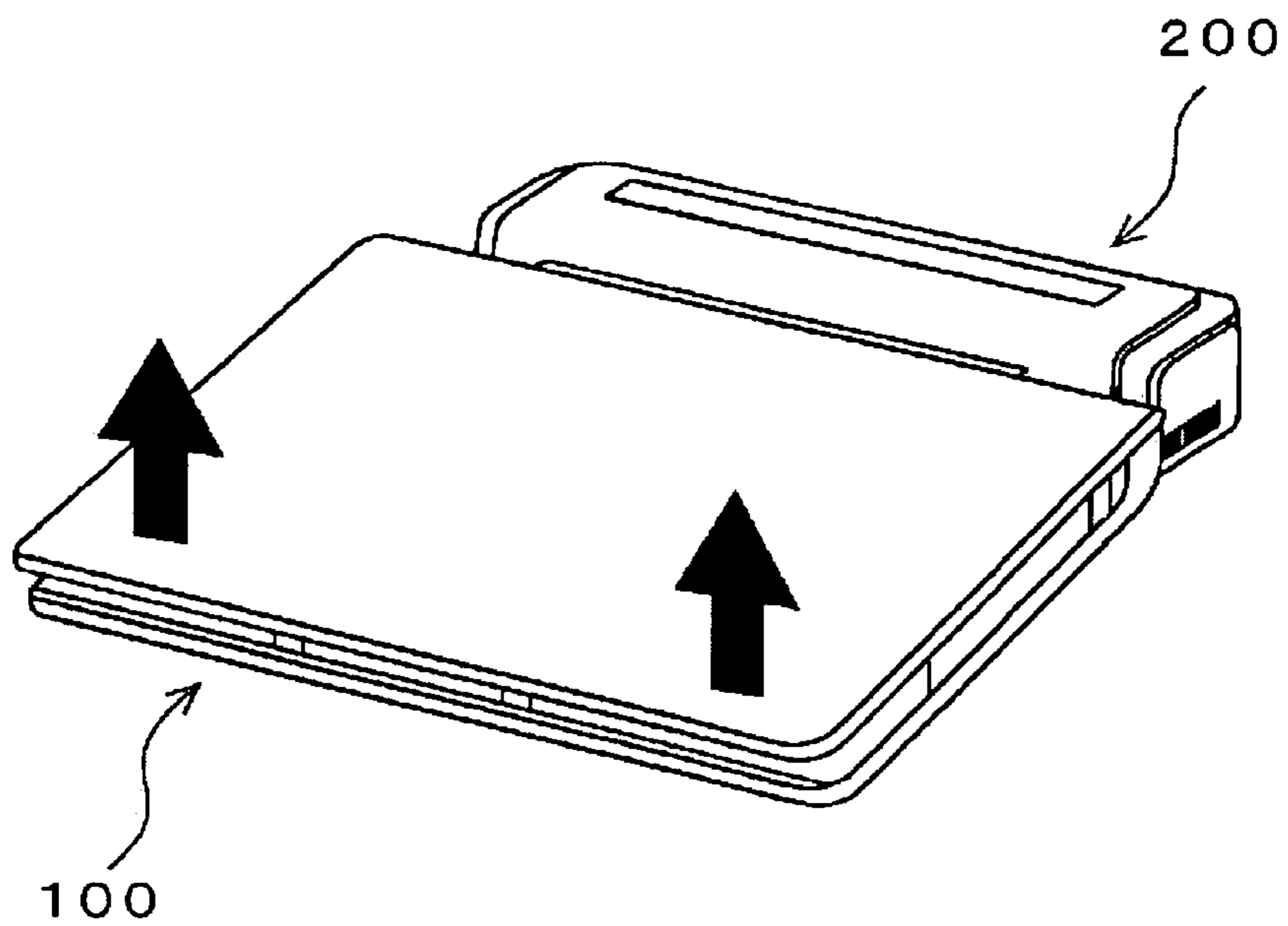


FIG. 11

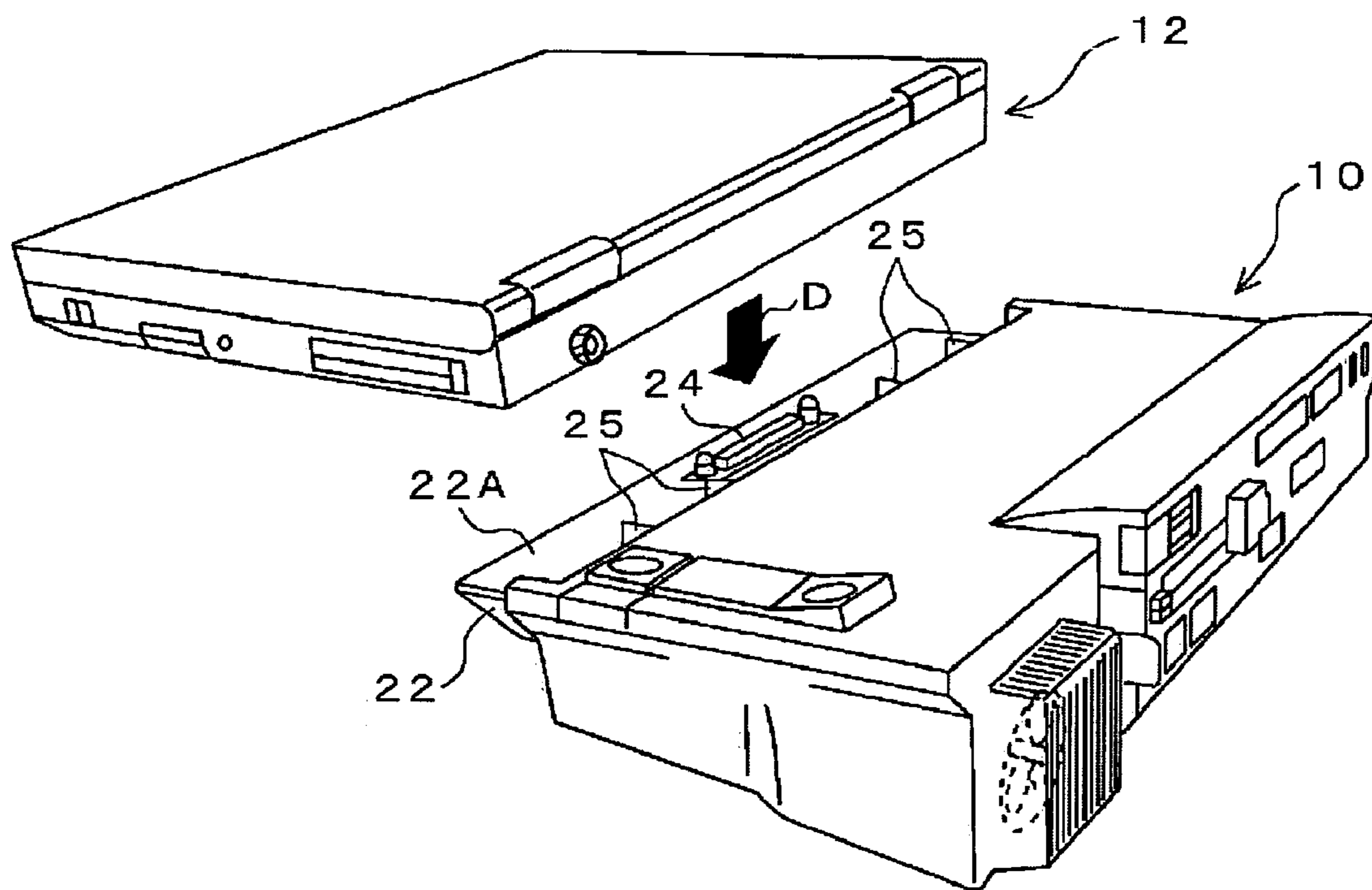
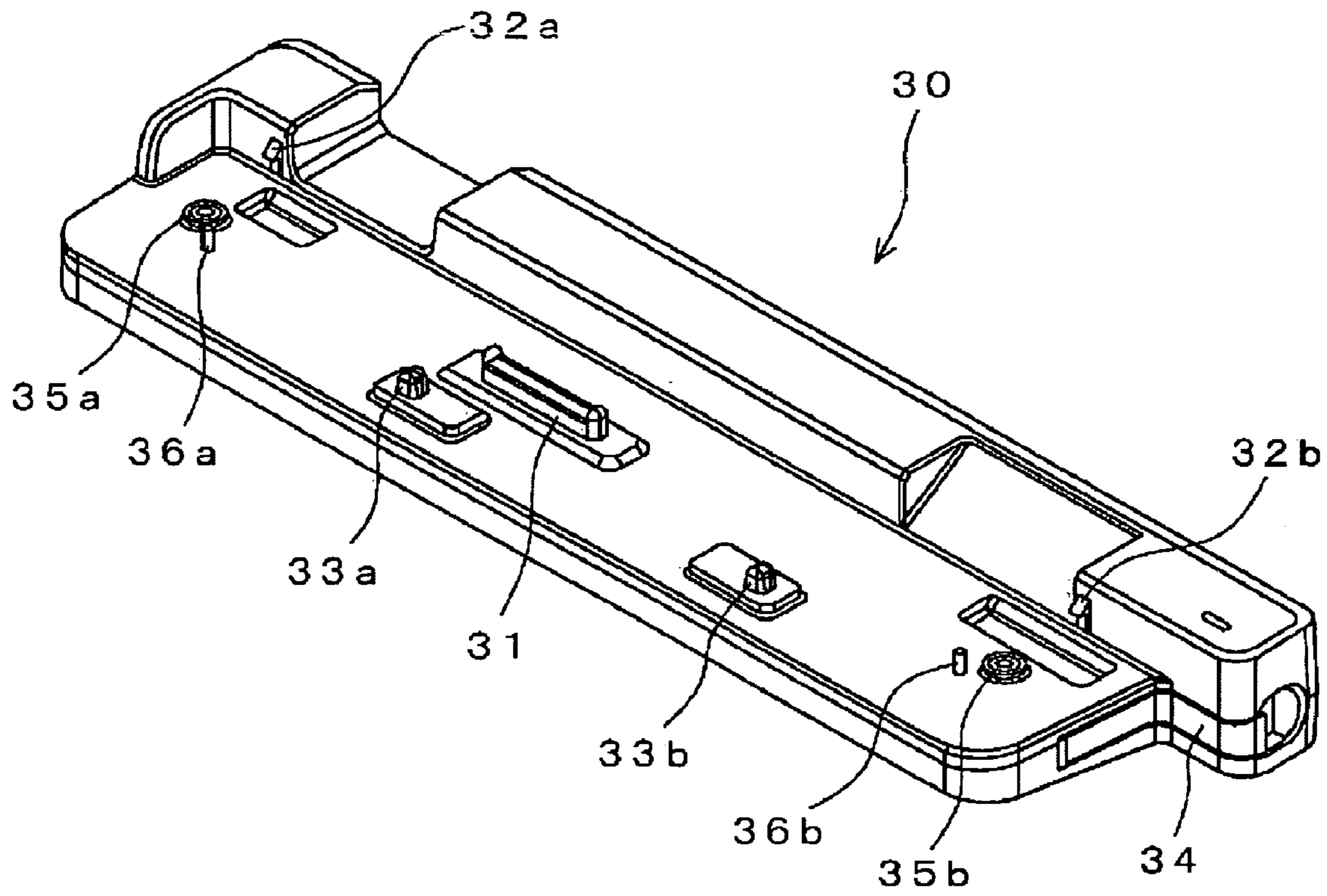


FIG. 12



DOCKING DEVICE FOR PORTABLE COMPUTER AND DOCKING STRUCTURE

CROSS REFERENCES TO RELATED APPLICATIONS

The present invention contains subject matter related to Japanese Patent Application JP 2004-139136 filed in the Japanese Patent Office on May 7, 2004, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a docking device for portable computers and a docking structure mechanically and electrically connected to a portable computer so as to expand the function of the portable computer. In detail, the docking device includes a tray for placing the rear end of the portable computer thereon and a locking unit for locking the portable computer on the tray by manual operation, in which the tray includes a claw member to be mated with an incised portion formed on the back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably by a predetermined angle. The movable tray includes two recesses equivalent in shape to legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking, so that the device may improve in design while the pin of the docking connector may be prevented from being bent.

2. Description of the Related Art

In order to enrich the function of a portable computer, a docking device has been used. The docking device is for expanding the function of a portable computer by mechanically and electrically connecting to the portable computer. It is important that peripheral devices be mounted on the portable computer promptly, easily, and versatily.

A docking structure has been proposed in that a portable computer is dropped within a recess formed on a docking device (see Japanese Patent Publication No. 3197843, page 3 to 4, FIGS. 1 and 2, for example).

In this case, for setting the portable computer in a predetermined position of the docking device, the device is provided with the recess. Upon docking, the positioning is facilitated by dropping the portable computer into the recess.

Another docking structure has been disclosed in that the portable computer is mounted on a docking device along guide pins or ribs (see Japanese Unexamined Patent Application Publication No. 2001-306186, page 4 to 5, FIG. 5, for example).

FIG. 11 is a drawing of a structure of a docking device in related art having a plurality of guides. A docking device 10, as shown in FIG. 11, is provided with a plurality of projections 25 formed on a support surface 22A for placing a rear-end bottom surface (docking side) of a portable computer 12. Upon docking, the portable computer 12 is laterally positioned with these guides 25 and then, is pushed down to be docked by positionally fitting the portable computer 12 to an interface connector 24 for electrical connection.

A docking structure having an automatic locking mechanism has been proposed. FIG. 12 is a drawing of a docking device having an automatic locking mechanism in related art.

A docking device 30, as shown in FIG. 12, includes a docking connector 31, hooks 32a and 32b for fixing the back surface of a portable computer, hooks 33a and 33b for fixing the front side of the computer, a lever 34 for removing the computer, push-up pins 35a and 35b, and ground pins 36a and 36b. The hooks 33a and 33b have spring mechanisms.

In this case, when a battery is replaced in a docked state, if the docking connector comes off, an automatic locking mechanism has been used for preventing data from charging off due to the shutdown.

In this automatic locking mechanism, the hooks having spring mechanisms are inserted into locking holes formed on the bottom surface of the portable computer, so that the portable computer is fixed on a tray of the docking device.

However, in Japanese Patent Publication No. 3197843 mentioned above, although the positioning is facilitated, a problem has arisen in that a docking device body is increased in size.

In the case of the above Publication No. 2001-306186, since the support surface 22A is provided with a plurality of the projections 25 for guiding, there are problems of unrefined design and difficulties in positioning.

In the docking structure having the automatic locking mechanism mentioned above, the positioning is difficult and during docking, the portable computer is necessary to be pushed from the top for retaining the hooks having springs to the locking holes. Accordingly, a large force is applied to the connector so as to deform the connection pin.

Accordingly, it is desirable to provide a docking device and a docking structure for a portable computer capable of facilitating docking and improving in design as well as being capable of preventing a docking connector pin from bending.

In a docking device for a portable computer according to an embodiment of the present invention to be mechanically and electrically connected to the portable computer to expand the function of the portable computer, the docking device includes a tray for placing the rear end of the portable computer thereon; and a locking unit for locking the portable computer on the tray by manual operation, wherein the tray includes a claw member to be mated with an incised portion formed on the back surface of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably by a predetermined angle, the movable tray having two recesses equivalent in shape to legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking.

For example, the locking unit may include a slide locking switch and two hooks to be inserted into locking holes formed on the bottom surface of the portable computer in association with the slide locking switch operatively.

Also, the movable tray may include a spring mechanism, so that during non-docking, the movable tray is raised from the bottom plate by the spring mechanism so as to have a position not exposing the docking connector and the hooks on the surface, while during docking, the movable tray is pushed down by the portable computer so as to have a position being in contact with the surface of bottom plate.

A docking structure according to another embodiment of the present invention includes a portable computer; and a docking device for expanding the function of the portable thereon by mechanically and electrically connecting between the portable computer and the docking device, wherein the portable computer includes circular conical legs, an incised portion formed on the back face, and locking

holes formed on the bottom surface, and wherein the docking device includes a tray for placing the rear end of the portable computer thereon and a locking unit for locking the portable computer on the tray, the tray having a claw member to be mated with the incised portion formed on the back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably by a predetermined angle, the movable tray having two recesses equivalent in shape to the legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking.

According to the present invention, the portable computer includes the circular conical legs, the incised portion formed on the back face, and the locking holes formed on the bottom surface. The docking device also includes the tray for placing the rear end of the portable computer thereon and the locking unit for locking the portable computer on the tray, in which the tray includes the claw member to be mated with the incised portion formed on the back face of the portable computer, the bottom plate having the docking connector arranged thereon for electrically connecting to the portable computer, and the movable tray arranged on the bottom plate rotatably by a predetermined angle. The movable tray includes the two recesses equivalent in shape to the legs formed at the rear end of the portable computer and the opening for exposing the docking connector and the locking unit during docking.

Thereby, during the docking, the positioning operation is structurally separated from the connecting operation. Furthermore, by providing the conical recesses for positioning, which are equivalent to the legs of the portable computer in shape, the displacement when the portable computer is placed during the docking may be automatically corrected, facilitating the docking between the portable computer and the docking device. During the non-docking, since the docking connector and so forth are not exposed on the surface of the movable tray, the device may improve in design.

Also, using the manually-operated locking unit, the operation intensely pushing the portable computer body for retaining the hooks with springs into the locking holes from the top may be eliminated, so that the pin of the docking connector may be prevented from being bent. By only sliding the slide locking switch of the locking unit to the unlock side so as to raise the portable computer, undocking may be easily made.

According to the present invention, the portable computer includes the circular conical legs, the incised portion formed on the back face, and the locking holes formed on the bottom surface. The docking device also includes the tray for placing the rear end of the portable computer thereon and the locking unit for locking the portable computer on the tray, in which the tray includes the claw member to be mated with the incised portion formed on the back face of the portable computer, the bottom plate having the docking connector arranged thereon for electrically connecting to the portable computer, and the movable tray arranged on the bottom plate rotatably by a predetermined angle. The movable tray includes the two recesses equivalent in shape to the legs formed at the rear end of the portable computer and the opening for exposing the docking connector and the locking unit during docking, so that the device may improve in design and the docking may be facilitated while the pin of the docking connector may be prevented from being bent.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a drawing of a docking state between a portable computer 100 and a docking device 200 for a portable computer;

FIGS. 2A and 2B are drawings of the structure of the portable computer 100;

FIG. 3 is a drawing of the structure of the docking device 200 for a portable computer according to an embodiment;

FIG. 4 is a side view of the structure of the docking device 200;

FIGS. 5A to 5C are drawings of associated parts of a hop-up tray 206;

FIG. 6 is a perspective view of the portable computer 100 and the docking device 200 before the portable computer 100 is mounted;

FIG. 7 is a side view of the portable computer 100 and the docking device 200 before the portable computer 100 is mounted;

FIG. 8 is a perspective view of a state of the portable computer 100 placed on a tray;

FIGS. 9A and 9B are side views of states of the portable computer 100 placed on the tray;

FIG. 10 is a drawing showing the removing operation of the portable computer 100;

FIG. 11 is a drawing of a structure of a docking device in related art having a plurality of guides; and

FIG. 12 is a drawing of a docking device having an automatic locking mechanism in related art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A docking device and a docking structure for a portable computer according to an embodiment of the present invention will be described below with reference to the drawings.

FIG. 1 is a drawing of a docking state between a portable computer 100 and a docking device 200 for a portable computer according to the embodiment of the present invention.

As shown in FIG. 1, when the portable computer 100 is docked to the docking device 200, the rear end of the bottom surface of the portable computer is placed on a tray of the docking device 200.

FIGS. 2A and 2B are drawings of the structure of the portable computer 100 according to the embodiment of the present invention. As shown in FIG. 2A, the bottom surface 101 of the portable computer 100 is provided with legs 102a and 102b, locking holes 103a and 103b, ground contacts 104a and 104b, and a docking connector 105. The back face (end face to be docked) of the portable computer 100 is provided with an incised portion 106. FIG. 2B is a side view of the leg of the portable computer 100. The legs 102a and 102b have circular conical shapes.

FIG. 3 is a drawing of the structure of the docking device 200 for a portable computer according to the embodiment of the present invention. As shown in FIG. 3, the docking device 200 is composed of a docking device body 201, a bottom plate 202, a docking connector 203, ground pins 204a and 204b, projections 205a and 205b, a hop-up tray 206 as a movable tray, recesses 207a and 207b, a slide locking switch 208, hooks 209a and 209b, and a claw member 210.

In the docking device body 201, devices for expanding the function of the portable computer 100 are accommodated. The docking device body 201 is made integrally with the bottom plate 202 on which the hop-up tray 206 is provided.

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The bottom plate **202** is also provided with the docking connector **203**, the ground pins **204a** and **204b**, and the projections **205a** and **205b**.

The docking connector **203** is the same as a connector with guide pins for electrically connecting to the portable computer **100**, and can be fitted with the docking connector **105** on the bottom surface **101** of the portable computer **100** for electrically connecting thereto. The ground of the portable computer **100** becomes the same level as that of the docking device **200** with the electrical contact between the ground pins **204a** and **204b** and the ground contacts **104a** and **104b**. The projections **205a** and **205b** support the portable computer **100** when the docking device **200** is undocked from the portable computer **100**, and are provided with sheets resistant to friction covered on the surfaces. Providing the projections **205a** and **205b** prevents the hop-up tray **206** from being scuffed on the surface by the portable computer **100**.

The hop-up tray **206** is provided with the recesses **207a** and **207b** to be dropped by the two conical legs formed at the rear end of the portable computer **100**, respectively. The hop-up tray **206** is also provided with a plurality of openings formed for exposing the docking connector **203**, the ground pins **204a** and **204b**, the projections **205a** and **205b**, and the hooks **209a** and **209b** on the surface when the portable computer **100** is docked.

FIG. **3** shows a state of the hop-up tray **206** pushed by the portable computer **100** and located at a position after the docking. In this case, the docking connector **203**, the ground pins **204a** and **204b**, the projections **205a** and **205b**, and the hooks **209a** and **209b** are exposed on the surface of the hop-up tray **206**.

The recesses **207a** and **207b** are the same as circular conical recesses to be dropped by the two legs **102a** and **102b** provided at the rear end of the portable computer **100**, respectively. The shape of the respective recesses **207a** and **207b** is not limited to a circular cone, so that any shape may be applied as long as it can be fitted to the two legs **102a** and **102b**.

The slide locking switch **208** and the hooks **209a** and **209b** are functioning as locking units for fixing the portable computer **100** on a tray (i.e., the hop-up tray **206**). The hooks **209a** and **209b** are drivingly connected to the slide locking switch **208**.

The slide locking switch **208** has an operating knob for operating the hooks **209a** and **209b**, and when the operating knob is slid to the locking side, the portable computer **100** is fixed to the tray by inserting the hooks **209a** and **209b** into the locking holes **103a** and **103b** provided on the bottom surface of the portable computer **100**. In addition, when the operating knob is slid to the un-locking side, the hooks **209a** and **209b** come off the locking holes **103a** and **103b** on the bottom surface of the portable computer **100** so as to raise the portable computer **100**, so that it can be easily undocked from the docking device **200**.

The claw member **210** is to be brought into engagement with the incised portion **106** on the back face (end face to be docked) of the portable computer **100**, and has a function to press an end of the portable computer **100** during the docking. The claw member **210** has a spring mechanism so as to be pushed inside.

FIG. **4** is a side view of the structure of the docking device **200** showing a non-docking state of the docking device **200**. The hop-up tray **206**, as shown in FIG. **4**, is supported by a tray support bracket **211** and is raised by a spring **212** during the non-docking state, showing the maximum angular position.

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FIGS. **5A** to **5C** are drawings of associated parts of the hop-up tray **206**: FIG. **5A** shows a tray **206A** having an arm for attaching the tray **206A** to a rotational shaft; FIG. **5B** shows an example of the tray support bracket **211**; and FIG. **5C** shows an example of the spring **212**.

As shown in FIG. **4** mentioned above, during the non-docking state, the hop-up tray **206** is raised from the bottom plate **202** and is located at a position not exposing the docking connector **203** and so forth on the surface.

Since the docking connector **203**, the ground pins **204a** and **204b**, the projections **205a** and **205b**, and the hooks **209a** and **209b** are not thereby exposed on the surface of the hop-up tray **206**, the device improves in design.

The docking operation of the portable computer **100** into the docking device **200** will be described below with reference to FIGS. **6** to **9**. FIG. **6** is a perspective view of the portable computer **100** and the docking device **200** before the portable computer **100** is mounted; FIG. **7** is a side view of them before being mounted; FIG. **8** is a perspective view of a state of the portable computer **100** placed on the tray; and FIGS. **9A** and **9B** are side views of states of the portable computer **100** placed on the tray.

Upon docking the portable computer **100** to the docking device **200**, first, the operation knob of the slide locking switch **208** is slid to the unlocking side.

Then, as shown in FIGS. **6** and **7**, the portable computer **100** is placed on the docking device **200**. At this time, the positioning is made by inserting the legs **102a** and **102b** of the portable computer **100** into the recesses **207a** and **207b** of the hop-up tray **206**, respectively. Simultaneously, the claw member **210** is automatically retained to the incised portion **106** on the back face of the portable computer **100**. Then, as shown in FIGS. **8** to **9B**, the front side of the portable computer **100** is calmly lowered down, thereby bringing the docking connector **105** into engagement with the docking connector **203**.

Finally, the operating knob of the slide locking switch **208** is slid to the locking side so as to complete the docking.

When the portable computer **100** is mounted, as shown in FIG. **9B**, the rear end of the bottom surface **101** of the portable computer **100** is placed on the tray while the hop-up tray **206** is pushed down onto the bottom plate **202** by the portable computer **100**. At this time, the hooks **209a** and **209b** are inserted into the locking holes **103a** and **103b** formed on the bottom surface of the portable computer **100**, respectively, while the docking connector **203** is brought into engagement with the docking connector **105** formed on the bottom surface of the portable computer **100**.

When the portable computer **100** is removed from the docking device **200**, the operating knob of the slide locking switch **208** is slid to the unlocking side.

Then, as shown in FIG. **10**, the portable computer **100** is raised up from the front side, thereby separating the portable computer **100** from the docking device **200** by disconnecting the docking connector **203** from the portable computer **100**.

As described above, according to the embodiment, the portable computer **100** has the legs **102a** and **102b**, the incised portion **106**, and the locking holes **103a** and **103b** formed on the bottom surface. The docking device **200** also has the docking device body **201**, the bottom-plate **202**, the docking connector **203**, the ground pins **204a** and **204b**, the projections **205a** and **205b**, the hop-up tray **206** as a movable tray, the recesses **207a** and **207b**, the slide locking switch **208**, the hooks **209a** and **209b**, and the claw member **210**. Upon docking, the positioning is made with the legs **102a** and **102b** of the portable computer **100** and the recesses **207a** and **207b**; then, the docking connector **105** is brought into

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engagement with the docking connector **203** by lowering the front side of the portable computer **100**; finally, the locking is made with the slide locking switch **208**.

Thereby, during the docking, the positioning operation is structurally separated from the connecting operation. Furthermore, by providing the conical recesses **207a** and **207b** for positioning, which are equivalent to the legs of the portable computer **100** in shape, the displacement when the portable computer **100** is placed during the docking is automatically corrected, facilitating the docking between the portable computer **100** and the docking device **200**. During the non-docking, since the docking connector **203** and so forth are not exposed on the surface of the hop-up tray **206**, the device improves in design.

Also, using the manually-operated slide locking switch **208**, the operation intensely pushing the portable computer body for retaining the hooks with springs into the locking holes from the top is eliminated, so that the pin of the docking connector **203** is prevented from being bent. By only sliding the slide locking switch **208** to the unlock side so as to raise the portable computer **100**, undocking is easily made.

In addition, according to the embodiment, as the locking unit, the slide locking switch **208** and the two hooks **209a** and **209b** for inserting into the recesses on the bottom surface of the portable computer **100** are used; however, the present invention is not limited to this, so that other manually-operated locking mechanism may be used.

It should be understood by those skilled in the art that various modifications, combinations, sub-combinations and alterations may occur depending on design requirements and other factors insofar as they are within the scope of the appended claims or the equivalents thereof.

What is claimed is:

1. A docking device for a portable computer to be mechanically and electrically connected to the portable computer to expand the function of the portable computer, the device comprising:

a tray for placing a rear end of the portable computer thereon; and

locking means for locking the portable computer on the tray by manual operation,

wherein the tray includes

a claw member to be mated with an incised portion formed on a back face of the portable computer,

a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and

a movable tray arranged on the bottom plate rotatably about an axis by a predetermined angle, the movable tray having two recesses equivalent in shape to legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking means during docking, said axis being disposed adjacent said rear end of said portable computer such that a fore end of said portable computer rotatably forces said movable tray to pivot about said axis when said fore end of said portable computer is lowered on said movable tray during a docking operation.

2. The device according to claim **1**, wherein the locking means includes a slide locking switch and two hooks to be inserted into locking holes formed on the bottom surface of the portable computer in association with the slide locking switch operatively.

3. The device according to claim **2**, wherein the movable tray includes a spring mechanism, so that during non-

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docking, the movable tray is raised from the bottom plate by the spring mechanism so as to have a position not exposing the docking connector and the hooks on the surface, while during docking, the movable tray is pushed down by the portable computer so as to have a position being in contact with the surface of bottom plate.

4. The device according to claim **1**, wherein the recesses have a circular conical shape.

5. A docking structure comprising:

a portable computer; and

a docking device for expanding the function of the portable computer, the docking device docking the portable computer thereon by mechanically and electrically connecting between the portable computer and the docking device,

wherein the portable computer includes circular conical legs, an incised portion formed on a back face, and locking holes formed on the bottom surface, and wherein the docking device includes a tray for placing a rear end of the portable computer thereon and locking means for locking the portable computer on the tray, the tray having a claw member to be mated with the incised portion formed on the back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably about an axis by a predetermined angle, the movable tray having two recesses equivalent in shape to the legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking means during docking, said axis being disposed adjacent said rear end of said portable computer such that a fore end of said portable computer rotatably forces said movable tray to pivot about said axis when said fore end of said portable computer is lowered on said movable tray during a docking operation.

6. A docking device for a portable computer to be mechanically and electrically connected to the portable computer to expand the function of the portable computer, the device comprising:

a tray for placing a rear end of the portable computer thereon; and

a locking unit for locking the portable computer on the tray by manual operation,

wherein the tray includes a claw member to be mated with an incised portion formed on a back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the bottom plate rotatably about an axis by a predetermined angle, the movable tray having two recesses equivalent in shape to legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking, said axis being disposed adjacent said rear end of said portable computer such that a fore end of said portable computer rotatably forces said movable tray to pivot about said axis when said fore end of said portable computer is lowered on said movable tray during a docking operation.

7. A docking structure comprising:

a portable computer; and

a docking device for expanding the function of the portable computer, the docking device docking the

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portable computer thereon by mechanically and electrically connecting between the portable computer and the docking device,
wherein the portable computer includes circular conical legs, an incised portion formed on a back face, and locking holes formed on the bottom surface, and
wherein the docking device includes a tray for placing a rear end of the portable computer thereon and a locking unit for locking the portable computer on the tray, the tray having a claw member to be mated with the incised portion formed on the back face of the portable computer, a bottom plate having a docking connector arranged thereon for electrically connecting to the portable computer, and a movable tray arranged on the

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bottom plate rotatably about an axis by a predetermined angle, the movable tray having two recesses equivalent in shape to the legs formed at the rear end of the portable computer and an opening for exposing the docking connector and the locking unit during docking, said axis being disposed adjacent said rear end of said portable computer such that a fore end of said portable computer rotatably forces said movable tray to pivot about said axis when said fore end of said portable computer is lowered on said movable tray during a docking operation.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,359,185 B2
APPLICATION NO. : 11/124546
DATED : April 15, 2008
INVENTOR(S) : Koichi Hiroyoshi

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2, between lines 14 and 15, insert

--SUMMARY OF THE INVENTION--

Signed and Sealed this

Eighteenth Day of November, 2008

A handwritten signature in black ink that reads "Jon W. Dudas". The signature is written in a cursive style with a large, looped initial "J".

JON W. DUDAS

Director of the United States Patent and Trademark Office